

CLAIMS

What is claimed is:

1. A semiconductor processing system, comprising:
a processing chamber operable to develop an ultra-thin resist having a thickness of about 5,000 Å or less and etch a hardmask;
a supply of a developer for contact with the ultra-thin resist;
a supply of an etch solution; and
a measurement system for in situ monitoring of patterning the ultra-thin resist and the hardmask and for providing a measurement signal indicative of the measured patterning.
2. The semiconductor processing system according to claim 1, further comprising a control system for controlling treatment parameters within the chamber, the control system adjusting the treatment parameters to control patterning based on the measurement signal.
3. The semiconductor processing system according to claim 1, wherein the measurement system comprises one selected from the group consisting of a scatterometry system, an ellipsometry system, a UV/vis spectrophotometry system, and an x-ray reflectometry system.
4. The semiconductor processing system according to claim 1, wherein the hardmask comprises one or more selected from the group consisting of oxides, nitrides, and metal containing materials.
5. The semiconductor processing system according to claim 1, wherein the supply of etch solution comprises one or more selected from the group consisting of a buffered oxide etch solution, an HF solution, a phosphoric acid solution, and a peroxide solution.

6. The semiconductor processing system according to claim 1, wherein the hardmask comprises an oxide and the supply of etch solution comprises a buffered oxide etch solution or an HF solution.

7. The semiconductor processing system according to claim 1, wherein the hardmask comprises a nitride and the supply of etch solution comprises a phosphoric acid solution.

8. The semiconductor processing system according to claim 1, wherein the hardmask comprises a metal containing material and the supply of etch solution comprises a peroxide solution.

9. A method of processing an ultra-thin resist, comprising:
 depositing the ultra-thin resist over a hardmask layer that is over a semiconductor substrate, the ultra-thin resist having a thickness less than about 5,000 Å;
 irradiating the ultra-thin resist with electromagnetic radiation having a wavelength of about 250 nm or less;
 developing the ultra-thin resist with a developer to form a patterned resist, wherein the ultra-thin resist is not dried; and
 etching the hardmask layer with an etch solution within about 1 minute after developing to provide a patterned hardmask.

10. The method of claim 9, wherein the ultra-thin resist has a thickness of less than about 3,000 Å.

11. The method of claim 9, wherein the hardmask layer has a thickness of about 100 Å or more and about 5,000 Å or less.

12. The method of claim 9, wherein the hardmask layer comprises an oxide and the etch solution comprises a buffered oxide etch solution or an HF solution.

13. The method of claim 9, wherein the hardmask layer comprises a nitride and the etch solution comprises a phosphoric acid solution.

14. The method of claim 9, wherein the hardmask layer comprises a metal containing material and the etch solution comprises a peroxide solution.

15. The method of claim 9, wherein the metal containing material comprises at least one selected from the group consisting of titanium, titanium nitride, tungsten, tantalum, and tantalum nitride.

16. The method of claim 9, wherein the electromagnetic radiation has a wavelength of about 200 nm or less.

17. The method of claim 9, wherein the electromagnetic radiation comprises at least one of light having a wavelength about 248 nm, about 193 nm, about 157 nm, about 13 nm, about 11 nm, or about 1 nm, and e-beams.

18. The method of claim 9, wherein the hardmask layer within about 30 seconds after developing.

19. The method of claim 9, further comprising rinsing the patterned resist with a solution comprising deionized water just prior to etching the hardmask layer.